

Time -

We have maintain 2 lists one for max and other for min

And after each insertion and deletion we have sorted that list so each of them take $O(n \log n)$ operations and At worst, there are three heap insertions and two heap deletions from the top thus $5 * n \log n$

Thus we have $O(n \log n)$ time complexity

Space -

$O(n)$ space to hold them in the priority queue